



# BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

State Transportation Building  
Ten Park Plaza, Suite 2150  
Boston, MA 02116-3968  
Tel. (617) 973-7100  
Fax (617) 973-8855  
TTY (617) 973-7089  
www.bostonmpo.org

Jeffrey B. Mullan  
MassDOT Secretary and CEO  
and MPO Chairman

Arnold J. Soolman  
Director, MPO Staff

The Boston Region MPO,  
the federally designated  
entity responsible for  
transportation decision-  
making for the 101 cities  
and towns in the MPO  
region, is composed of:

MassDOT Office of Planning and  
Programming  
City of Boston  
City of Newton  
City of Somerville  
Town of Bedford  
Town of Braintree  
Town of Framingham  
Town of Hopkinton  
Metropolitan Area Planning Council  
Massachusetts Bay Transportation  
Authority Advisory Board  
Massachusetts Bay Transportation  
Authority  
MassDOT Highway Division  
Massachusetts Port Authority  
Regional Transportation Advisory  
Council (nonvoting)  
Federal Highway Administration  
(nonvoting)  
Federal Transit Administration  
(nonvoting)

## MEMORANDUM

**DATE** February 4, 2010  
**TO** Transportation Planning and Programming Committee  
of the Boston Region Metropolitan Planning Organization  
**FROM** Arnold J. Soolman, CTPS Director  
**RE** Work Program for: Emergency Evacuation and Hazard Mitigation  
Mapping

### ACTION REQUIRED

Review and approval

### PROPOSED MOTION

That the Transportation Planning and Programming Committee of the Boston Region Metropolitan Planning Organization, upon the recommendation of the Massachusetts Department of Transportation, vote to approve the work program for Emergency Evacuation and Hazard Mitigation Mapping in the form of the draft dated February 4, 2010.

### PROJECT IDENTIFICATION

Unified Planning Work Program Classification  
Technical Support/Operations Analysis Projects

CTPS Project Number  
11140

Clients  
Boston Region Metropolitan Planning Organization  
Massachusetts Department of Transportation

CTPS Project Supervisors  
*Principal:* Pam Wolfe  
*Manager:* Maureen Kelly

Funding  
MPO FTA \$5303 3C Planning Contract #MA-80-0004; MassDOT 3C PL  
Highway Planning Contract #59796

## IMPACT ON MPO WORK

This is MPO work and will be carried out in conformance with the priorities established by the MPO.

## BACKGROUND

This work program involves mapping the transportation network and projects proposed for MPO funding with overlays of evacuation routes, critical infrastructure related to evacuation and security planning, and areas prone to natural hazards and sea level rise.

In proposing the activities outlined in this work program, staff took several factors into account:

- The federal requirements under SAFETEA-LU that MPOs consider security as a distinct factor in their planning processes and work to increase security for all users of the transportation system
- The expectation, based on reviews of federal literature and topics discussed at this year's Association of Metropolitan Planning Organizations conference, that the next authorization of federal transportation legislation will have a security and climate-change element
- Recent federal guidance advising coastal MPOs to begin an inventory for their next regional transportation plans of transportation infrastructure that may be affected by climate change, particularly in terms of flooding from the anticipated rise of sea levels and more frequent and intense storms

In light of these factors, MPO staff believe that it is important for the MPO to begin this work program as a first step toward an MPO program for all-hazards planning that addresses the protection of the region's transportation infrastructure from both natural and man-made threats, and security for the people who use the system and who will depend upon it during times of emergency.

## OBJECTIVE(S)

There are three objectives of this work program:

1. The first objective is to provide information that can help the MPO determine if planned transportation projects would improve infrastructure for emergency management functions and evacuation, serve critical infrastructure, or include adaptation measures to protect against climate change impacts. This information will be used for the security evaluation for projects proposed for the Transportation Improvement Program (TIP) and Regional Transportation Plan (RTP) and for future evaluations regarding projects' benefits in terms of climate change adaptation. (products of Tasks 2, 3, and 4)

2. The second objective is to provide planning information that can be used to protect transportation infrastructure from natural hazards and climate change impacts. The study will determine if planned or existing facilities lie in areas prone to flooding or hurricane storm surges, for example. This information could be used to plan adaptive measures to protect infrastructure from extreme weather impacts. (products of Tasks 2)
3. The third objective is to provide information for evacuation planners that can be used to plan alternate evacuation routes in the event that infrastructure fails or is impassible due to flooding or other extreme weather events, and to assess which areas might need to be evacuated in advance of a weather event, such as a hurricane. This mapping may be used to inform contract preparation for TIP projects so as to facilitate a convergence of construction planning with consideration of emergency preparedness needs at key evacuation locations or infrastructure. (products of Task 2 and 3)

## WORK DESCRIPTION

The outcome of this work program will be a series of GIS-based maps.

### Task 1 Gather Information

Staff will collect data from evacuation, hazard mitigation, and security planning work that is underway in the region, and GIS data layers on natural hazards. Below is a list of materials that staff has access to and sources that staff will attempt to collect data from:

#### Natural Hazards:

- Flood zones (source: FEMA Flood Insurance Rate Maps)
- Sea, Lake, and Overland Surges from Hurricanes (source: NOAA National Hurricane Center)
- Seismic hazards (source: USGS)
- Sea Level Rise (source: Recommendations pending from the Climate Change Adaptation Advisory Committee, created under the Global Warming Solutions Act)

#### Evacuation Plans:

- Metro Boston Traffic Management Plan
  - Evacuation routes emanating from Boston urban core area (source: Metro Boston Homeland Security Council/City of Boston)
  - Traffic control points (source: State Police)
  - MBTA bus evacuation plan (source: MBTA)

- Other regional evacuation routes and planning data within the Boston Region MPO area (source: Homeland Security Regions, including MAPC's work with the Northeast Homeland Security Advisory Council)

**Critical Infrastructure:**

- Transportation infrastructure (source: MassDOT)
- Local infrastructure relevant to emergency planning (source: MAPC's pre-disaster mitigation plans)

*Product of Task 1*

An inventory of data and sources for conducting Tasks 2 and 3.

**Task 2 Create Base Map for the Boston Region MPO Area and Apply Natural Hazard Data Layers**

The base map will show the roadway and transit network for the Boston Region MPO area. Projects programmed in and proposed for the upcoming annual element of the federal fiscal years (FFYs) 2010– 013 TIP and programmed in the regional transportation plan, JOURNEY TO 2030, will be applied to the base map.

The first series of maps will show the projects' locations in relation to natural hazard zones using GIS data layers depicting flood zones (developed by FEMA); Sea, Lake and Overland Surges from Hurricanes (SLOSH) zones\* showing areas at risks for inundation during various category hurricanes (from NOAA); and areas that would be at risk from earthquakes (from USGS seismic hazard data and information on the location of filled land). Areas that will potentially be affected by sea level rise will also be identified based on recommendations for estimating these impacts, which are expected to be developed through the Global Warming Solutions Act process, or by using other accepted measures. (The Global Warming Solutions Act is a 2008 law requiring the Commonwealth to reduce greenhouse gas emissions and to develop climate change adaptation strategies.)

- \* Note: FEMA flood zones are based on rainfall data, while NOAA's SLOSH zones are based on estimates of the maximum height of hurricane storm surge that could be expected in various categories of hurricanes. NOAA uses weather data from past hurricanes to make these estimates.

*Products of Task 2*

- A series of maps showing the transportation network in the Boston Region with projects programmed in and proposed for the upcoming annual element of the FFYs 2010–2013 TIP and programmed in the RTP, and their proximity to natural hazard zones:
  - Flood zones for 100-year and 500-year floods
  - Hurricane surge zones
  - Areas at risk of inundation from rising sea levels

- Areas at risk for earthquake damage
- Summary maps symbolizing the portions of proposed TIP and RTP projects according to the number of natural hazard zones affecting those projects.

### Task 3 Apply Evacuation and Security Data Layers to Base Maps

The second set of maps will show the transportation network and TIP and RTP projects in relation to evacuation routes and infrastructure relevant to conducting an evacuation. These overlays will be added to the base map as information becomes available to the MPO from agencies conducting evacuation and security planning work.

Initially the focus will be on obtaining input from the planning underway for the Boston regional evacuation plan. This information may show the evacuation routes defined in the Metro Boston Traffic Management Plan (which encompasses the Greater Boston area within the Route 128 corridor)—highlighting traffic control points, access control points, and routes and destination points defined in the MBTA's bus evacuation plan—and critical infrastructure relevant to managing an evacuation.

Staff will seek to include evacuation routes and critical infrastructure locations identified by Regional Homeland Security Councils for the MPO areas that are outside of the urban core area and to incorporate data from MAPC's work on pre-disaster mitigation plans.

The extent of this work will depend on the amount of data available from other agencies. If this data is not available during the time frame of this work program, staff will propose to extend this work into the next UPWP.

#### *Products of Task 3*

- Maps showing projects programmed in and proposed for the upcoming annual element of the FFYs 2010–2013 TIP and programmed in the RTP, in relation to the following components of the Metro Boston evacuation plan:
  - Evacuation routes
  - Traffic control points
  - Access control points
  - MBTA bus evacuation plan routes
  - Critical infrastructure relevant to emergency planning (such as shelters, hospitals, transportation facilities)
- Maps showing TIP and RTP projects in relation to other evacuation plans in the region

#### Task 4 Document Information on the Security Benefits of TIP and RTP Projects

The TIP and RTP projects mapped in this exercise will be evaluated to determine whether they serve an evacuation plan or emergency management function or are located in areas prone to natural hazards or potentially affected by climate change.

For the emergency management evaluation, factors to consider will be whether the project improves or protects infrastructure that is important for emergency management or evacuation. Projects that improve traffic flow through key intersections or traffic control points, address bottlenecks, add capacity to evacuation routes, or improve access for emergency vehicles to critical infrastructure will receive higher security ratings in the TIP and RTP evaluation process.

For projects located in natural hazard zones, those that address structural deficiencies of infrastructure or include adaptation measures for climate change will also be considered as having a benefit. This work will provide input to future TIP and RTP evaluations regarding climate change adaptation.

##### *Product of Task 4*

A matrix providing information indicating if proposed TIP projects are in natural hazard zones or provide emergency management benefits. This information will be used in the TIP project evaluations.

#### ESTIMATED SCHEDULE

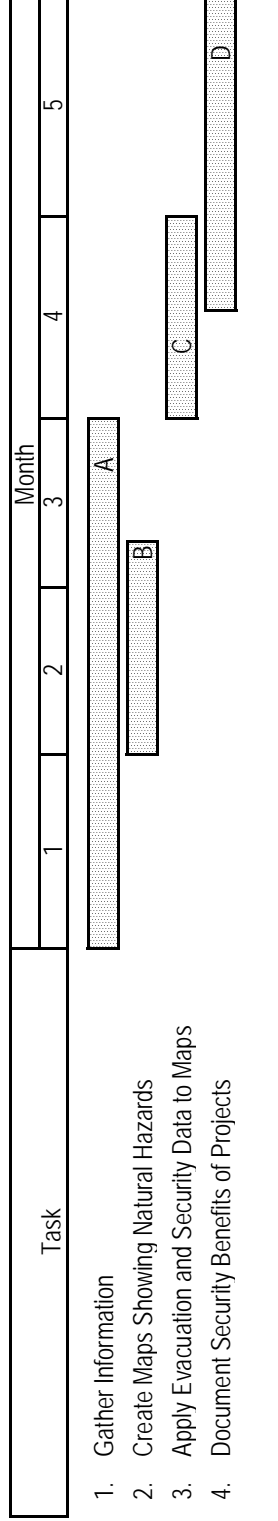
It is estimated that this project will be completed 5 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

#### ESTIMATED COST

The total cost of this project is estimated to be \$34,938. This includes the cost of 15.5 person-weeks of staff time, overhead at the rate of 88.99 percent, printing, and other direct costs. A detailed breakdown of estimated costs is presented in Exhibit 2.

AJS/MK/mk

**Exhibit 1**  
**ESTIMATED SCHEDULE**  
**Emergency Evacuation and Hazard Mitigation Mapping**



- Products/Milestones**
- A: Data inventory
  - B: Maps showing natural hazards
  - C: Maps showing evacuation routes and security data
  - D: Project matrix

Exhibit 2  
 ESTIMATED COST  
 Emergency Evacuation and Hazard Mitigation Mapping

**Direct Salary and Overhead** **\$33,928**

Task	Personnel				Total	Direct Salary	Overhead (@ 88.99%)	Total Cost
	M-1	P-4	P-3	Total				
1. Gather Information	0.0	1.0	3.0	4.0	\$4,307	\$3,833	\$8,140	
2. Create Maps Showing Natural Hazards	0.0	4.0	0.0	4.0	\$4,880	\$4,342	\$9,222	
3. Apply Evacuation and Security Data to Maps	0.0	3.0	0.0	3.0	\$3,660	\$3,257	\$6,916	
4. Document Security Benefits of Projects	1.0	2.0	1.0	4.0	\$5,106	\$4,544	\$9,650	
<b>Total</b>	<b>1.0</b>	<b>10.0</b>	<b>4.0</b>	<b>15.0</b>	<b>\$17,952</b>	<b>\$15,976</b>	<b>\$33,928</b>	

**Other Direct Costs** **\$1,010**

Purchase of DFIRMs \$1,010

**TOTAL COST** **\$34,938**

**Funding**  
 MPO FTA \$5303 3C Planning Contract #MA-80-0004; MassDOT 3C PL Highway Planning Contract #59796





# BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

State Transportation Building  
Ten Park Plaza, Suite 2150  
Boston, MA 02116-3968  
Tel. (617) 973-7100  
Fax (617) 973-8855  
TTY (617) 973-7089  
www.bostonmpo.org

Jeffrey B. Mullan  
MassDOT Secretary and CEO  
and MPO Chairman

Arnold J. Soolman  
Director, MPO Staff

The Boston Region MPO,  
the federally designated  
entity responsible for  
transportation decision-  
making for the 101 cities  
and towns in the MPO  
region, is composed of:

MassDOT Office of Planning and  
Programming  
City of Boston  
City of Newton  
City of Somerville  
Town of Bedford  
Town of Braintree  
Town of Framingham  
Town of Hopkinton  
Metropolitan Area Planning Council  
Massachusetts Bay Transportation  
Authority Advisory Board  
Massachusetts Bay Transportation  
Authority  
MassDOT Highway Division  
Massachusetts Port Authority  
Regional Transportation Advisory  
Council (nonvoting)  
Federal Highway Administration  
(nonvoting)  
Federal Transit Administration  
(nonvoting)

## MEMORANDUM

**DATE** February 4, 2010  
**TO** Transportation Planning and Programming Committee  
of the Boston Region Metropolitan Planning Organization  
**FROM** Arnold J. Soolman, CTPS Director  
**RE** Work Program for: MBTA Bus Service Data Collection VII

### ACTION REQUIRED

Review and approval

### PROPOSED MOTION

That the Transportation Planning and Programming Committee of the Boston Region Metropolitan Planning Organization, upon the recommendation of the Massachusetts Bay Transportation Authority, vote to approve the work program for MBTA Bus Service Data Collection VII in the form of the draft dated February 4, 2010.

### PROJECT IDENTIFICATION

**Unified Planning Work Program Classification**  
Technical Support/Operations Analysis Projects

**CTPS Project Number**  
11369

**Client**  
Massachusetts Bay Transportation Authority  
*Project Supervisor:* Melissa Dullea

**CTPS Project Supervisors**  
*Principal:* Karl Quackenbush  
*Manager:* Jonathan Belcher

**Funding**  
Future MBTA contract

## IMPACT ON MPO WORK

The MPO staff has sufficient resources to complete this work in a capable and timely manner. By undertaking this work, the MPO staff will neither delay the completion of nor reduce the quality of other work in the UPWP.

## BACKGROUND

In 1996, CTPS began the Comprehensive Ridecheck Program for the MBTA. This effort produced a comprehensive set of bus ridership and schedule adherence data, covering all routes within the span of one year. The data were then used as the primary input for the 1998 Service Plan. A second round of the Comprehensive Ridecheck Program was conducted in 1997 and 1998. This second set of data was used as one of the inputs for the 2002 Service Plan.

Since January 1999, CTPS has been performing ongoing monitoring of MBTA bus service, including ridechecks, timechecks, and pointchecks. The goal of this ongoing effort is to update the comprehensive database, with each route being ridechecked every three to five years, on average. These data feed the biennial MBTA Service Planning process (including the 2004, 2006, and 2008 MBTA Service Plans) and provide supplemental information for short-term corridor and subarea bus studies. The current ongoing program allows for much more flexibility in data collection than the previous comprehensive efforts.

During the past 13 years, CTPS has also provided MBTA Service Planning with analytical assistance to interpret the ridership and schedule adherence data. In particular, raw data are often examined immediately after being collected to determine whether any acute problems were observed in the field. Completed ridecheck trip summaries and load profiles, along with timecheck and pointcheck summaries, are also examined before transmittal to MBTA Service Planning. CTPS staff regularly recommend adjustments to scheduled frequency and running times to address identified problems.

Beginning in late 2007, the MBTA received new automated passenger counters (APCs) for its buses and trackless trolleys. These devices, which are currently being evaluated in the field at several of the MBTA's bus operating districts, should be able to provide the MBTA with information on the number of boardings and alightings at each stop. While these devices are being evaluated, manual ridechecks will need to continue at their regular pace, particularly for bus service districts that do not yet have any APC equipment installed. However, once they are distributed to larger numbers of buses, the need for manual ridechecks will decrease. At the same time, CTPS will need to modify its ridecheck database software to be able to accept passenger count information directly from APCs or to develop work assignments exclusively for trips not covered by APCs.

The MBTA also completed the installation of an automated fare-collection system in 2007. While this system can provide daily counts of boardings at rapid transit stations, manual

counts will still be required at key transfer stations to determine the distribution by mode of heavy rail, light rail, and bus rapid transit. Additional manual counts may also be required to determine boardings by direction.

## OBJECTIVES

1. To perform various forms of data collection on MBTA bus routes, including the following:

### *Ridechecks*

Using the same methods as were used in previous rounds of the Bus Service Data Collection Program, stop-by-stop ridership and running-time data will be collected on selected routes from the Albany Street, Arborway, Southampton Street, and Fellsway garages.

### *Timechecks*

For some frequently operated routes (those with peak-period headways of 12 minutes or less), timechecks will be conducted to monitor schedule adherence, travel time, headway maintenance, and overall ridership.

### *Pointchecks*

Pointchecks, or peak-load checks, may also be conducted to monitor overall ridership on selected routes.

2. To provide analytical assistance to the MBTA to identify crowding or schedule adherence problems on bus and trackless trolley routes, and to recommend changes in scheduled frequency and running times to address those problems.
3. To continue work on modifying the CTPS ridecheck database to accommodate ridership data input from automated passenger counters.
4. To conduct manual counts at one rapid transit station per year where multiple modes serve one facility, or at stations where boarding information by direction is required.

## WORK DESCRIPTION

### **Task 1 Determine Overall Schedule**

In cooperation with MBTA Service Planning, an overall schedule of data collection will be devised. This schedule will reflect the analysis priorities of the service planning

process as well as other ongoing studies. Routes not monitored during the previous Bus Service Data Collection Program will have higher priority in this round of data collection, as will newer routes and those that have undergone substantial changes. It is likely that the schedule will be updated quarter by quarter.

### ***Product of Task 1***

Overall schedule for data collection

## **Task 2 Prepare Assignments and Data-Collection Forms**

Within the guidelines of the overall schedule, specific assignments will be created on a week-to-week basis. Ridecheck assignments will be derived from MBTA timetables, as in the past. Assignments for timechecks and pointchecks will be designed as appropriate for the routes being studied.

Electronic data-collection forms for ridechecks, and paper data-collection forms for pointchecks and timechecks, will be prepared. These forms will be updated as necessary to properly coordinate with the MBTA Scheduling Department's stop database.

### ***Products of Task 2***

- Data-collection assignments
- Data-collection forms

## **Task 3 Collect Data**

CTPS staff members will carry out the assignments prepared in Task 2. As in the past, ridecheck data to be collected will include boardings and alightings by stop, farebox readings, vehicle trip time, departure/arrival times, and intermediate times. Both timecheck and pointcheck data include the vehicle number, direction, and time at each specified location, and the number of passengers onboard. Pointchecks, however, are conducted only at or near the peak-load point along the route, while timechecks require personnel to be positioned at the peak-load point, both termini, and other key locations. Rapid transit station counts require personnel at all entry locations to count passengers entering the system, and also can require counts at stairwells, escalators, and elevators within a station to determine what mode passengers are using and what direction they are traveling.

### ***Product of Task 3***

Ridership and schedule adherence data in digital or paper form

## **Task 4 Process and Analyze Data**

Ridecheck data will be uploaded into CTPS's bus and trackless trolley ridership database to ensure ready access. The database will be maintained by CTPS to facilitate the

preparation of specialized reports that may be requested periodically, including load profiles or trip summaries by day or time period, and ridership-at-stop reports.

Timecheck and pointcheck data will be summarized in spreadsheets to facilitate the analysis of run times by segment and provide peak-load summaries. Rapid transit station counts will be summarized in a database.

#### ***Products of Task 4***

- Summaries of timecheck and pointcheck data
- Ridecheck data in standardized database format

#### **Task 5 Produce Systematic Documentation**

Ridecheck data processed in Task 4 will be compiled into reports generated as Excel files and in other electronic formats, as requested. Trip summary (ridership by trip) and load profile (ridership by stop) reports for the fall, winter, and spring quarters will be produced. Reports covering the total passenger activity by stop will also be generated each of these three quarters, and tables showing the date of the most recent ridecheck for each route will be updated for three of the four scheduled quarters and supplied to the MBTA.

CTPS will also provide MBTA Service Planning staff with access to electronic versions of the ridecheck database. This will allow staff to generate the types of specialized reports mentioned in Task 4 on their desktop computers, and to save those reports in various electronic formats to facilitate analysis for the biennial service plans, Title VI reporting, and other planning studies.

#### ***Products of Task 5***

- Fall, winter, and spring quarterly reports
- Database of ridecheck data for MBTA in-house use

#### **Task 6 Review Ridecheck Results**

The results of Task 5 (systematic documentation), along with raw data from Task 3 (data collection), will be examined to identify problems with vehicle loads or schedule adherence on a route-by-route basis. Existing schedules will then be reviewed to determine appropriate corrective actions. These actions may include assigning additional vehicles to a route, lengthening or reducing segment-level running times, implementing short-turn services, and other items. Projected hours-of-service costs of implementing any recommended corrective actions will also be provided to the MBTA.

Upon request from MBTA Service Planning, CTPS may also utilize ridecheck results to generate tables of the net cost per passenger, boardings per hour, ridership by stop, etc. These data are regularly used in systemwide performance evaluations of MBTA bus

service and in decisions to reallocate vehicle resources from underutilized routes to those with unmet demand.

### ***Products of Task 6***

- Periodic summaries of service performance
- Periodic technical memoranda describing recommendations for service changes and associated cost projections

### **Task 7 Provide Ongoing Technical Support for Ridecheck Database**

As part of previous segments of the ongoing Bus Service Data Collection Program, CTPS has developed an improved Ridecheck Database Program that facilitates the creation of bus ridecheck assignments, downloading of assignments to handheld computers, uploading of completed ridecheck assignments from handheld computers, and generation of customized reports that are consistent with the MBTA Biennial Service Planning Process. The ridecheck database requires occasional ongoing technical support to continue to maintain both data processing functions and report generation.

***CTPS staff will also provide ongoing technical support to MBTA Operations staff in using Ridecheck Database Program software on their desktop computers.***

### **Task 8 Identify Means of Incorporating APC Data into the Ridecheck Database**

As described in the background section above, the MBTA has installed APCs onboard buses and trackless trolleys since 2007. While these machines are in evaluation and installation phase, manual ridechecks will continue. Once the machines are approved for widespread use throughout the system, the number of manual bus ridechecks needed will gradually decrease.

While the MBTA continues to use both methods of data collection, the APC data will need to be uploaded into the CTPS ridecheck database in order to run customized reports for biennial service plans and other ongoing service performance reviews, as discussed in Task 6. CTPS will continue to review data interchange methods, and formats for importing the data produced by the new APCs into its existing ridecheck database application. CTPS will coordinate with MBTA Service Planning to determine any changes to the sampling framework, in terms of both the number of routes that may be reported on in a given quarter and the number of observations of a particular scheduled trip that will be collected using APCs. At issue is the scalability of the ridecheck database application to larger storage requirements, as well as potential modifications to the program code associated with data processing and report generation. This task will also likely require coordination between CTPS's Information Technology and Services Group and the MBTA Operations personnel who develop and maintain APC databases.

The amount of this work to be completed as part of this project will depend on the MBTA's progress with APC installation.

***Product of Task 8***

Modified ridecheck database code

**ESTIMATED SCHEDULE**

It is estimated that this project will be completed 24 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

**ESTIMATED COST**

The total cost of this project is estimated to be \$453,896. This includes the cost of 346.5 person-weeks of staff time, overhead at the rate of 88.99 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

AJS/JB/jb

Exhibit 2  
 ESTIMATED COST  
 MBTA Bus Service Data Collection VII

**Direct Salary and Overhead** **\$453,414**

Task	Person-Weeks					Direct Salary	Overhead (@ 88.99%)	Total Cost		
	M-1	P-5	P-4	SP-3	SP-1				Temp	Total
1. Determine Overall Schedule	0.6	0.8	1.0	1.0	0.0	0.0	3.4	\$4,266	\$3,796	\$8,062
2. Prepare Assignments and Data-Collection Forms	3.8	0.0	14.0	1.0	0.0	20.0	38.8	\$34,270	\$30,497	\$64,767
3. Collect Data	0.2	0.0	0.0	38.0	70.0	159.5	267.7	\$154,194	\$137,218	\$291,412
4. Process and Analyze Data	0.9	0.0	4.0	0.0	0.0	0.0	4.9	\$6,353	\$5,654	\$12,007
5. Produce Systematic Documentation	0.0	0.0	1.0	0.0	0.0	0.0	1.0	\$1,220	\$1,086	\$2,305
6. Review Ridecheck Results	0.0	0.0	25.0	0.0	0.0	0.0	25.0	\$30,497	\$27,139	\$57,636
7. Provide Ongoing Technical Support for Ridecheck Database	0.0	2.4	0.0	0.0	0.0	0.0	2.4	\$3,829	\$3,407	\$7,236
8. Identify Means of Incorporating APC Data into the Ridecheck Database	0.5	2.8	0.0	0.0	0.0	0.0	3.3	\$5,285	\$4,703	\$9,989
Total	6.0	6.0	45.0	40.0	70.0	179.5	346.5	\$239,914	\$213,500	\$453,414

**Other Direct Costs** **\$482**

Travel \$482

**TOTAL COST** **\$453,896**

Funding  
 Future MBTA Contract



Exhibit 1  
 ESTIMATED SCHEDULE  
 MBTA Bus Service Data Collection VII

Task	Month																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1. Determine Overall Schedule																									
2. Prepare Assignments and Data-Collection Forms																									
3. Collect Data																									
4. Process and Analyze Data																									
5. Produce Systematic Documentation																									
6. Review Ridecheck Results																									
7. Provide Ongoing Technical Support for Ridecheck Database																									
8. Identify Means of Incorporating APC Data into the Ridecheck Database																									

Products/Milestones

- A: Ridecheck reports for fall, winter, and spring quarters
- B: Modified ridecheck database code